

CHAPTER 4

CUMULATIVE EFFECTS

INTRODUCTION

The Elko District Office is responsible for administering a variety of programs for management and conservation of resources on 12.5 million surface acres. This chapter summarizes past, present, and reasonably foreseeable activities in the Dixie Creek basin, which forms the basis for discussion of cumulative effects. Information contained in this chapter includes summaries of changes and/or progress made for activities within the Cumulative Effects Study Area (Study Area).

The Council on Environmental Quality (CEQ) defines cumulative impact as:

"Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

Past, present, and reasonably foreseeable land uses (e.g., grazing and recreation), activities (mining), and natural phenomena (wildfire) cumulatively affect resources to various degrees over a given area. The general cumulative effects Study Area (encompassing all resources except socio-economic and recreation) is shown on **Figure 4-1**. Cumulative effects are described on a resource by resource basis in this Chapter. Resource-specific Study Areas for cumulative effects are also described and the rationale used to designate the Study Areas.

Where appropriate, figures are provided in each resource description in this Chapter delineating the Study Area.

With the exception of some species of terrestrial wildlife, livestock grazing, and socio-economic resources, the geographic area for which past, present, and reasonably foreseeable future activities are described generally encompasses the Dixie Creek drainage basin.

PAST, PRESENT AND REASONABLY FORESEEABLE FUTURE ACTIVITIES

Land uses in the Study Area are primarily related to livestock grazing, off-highway vehicle use, dispersed recreation (hunting), and mining and mineral exploration. These uses of land in the vicinity of the Emigrant Project are described in Chapter 3 - *Affected Environment and Environmental Consequences*.

GRAZING

Past and Present Activities

Livestock grazing has been and continues to be the dominant land use in the Study Area. Multiple grazing allotments have been permitted and administered by BLM over several decades. All or portions of nine grazing allotments authorized to Tomera Ranches, Stonehouse Division exist within the Study Area encompassing 463,151 acres and active grazing privileges of 11,958 animal unit months (AUMs). Some of the allotments have been cross-fenced and subdivided into pastures. Capacity of these allotments has been adjusted over the years in response to mine development, drought, wildfires, and availability of stock water.

An allotment management plan (AMP) was developed and implemented for the Thomas Creek Allotment and prescribes the manner, and extent to which livestock grazing is conducted and managed to meet multiple use, sustained yield, economic, and other objectives as determined through the land planning process. The grazing permits for the remaining eight allotments describe the numbers and kinds of livestock authorized, periods of use, and the total AUMs of use available for licensing on an annual basis; however, formal allotment management plans have not yet been developed. Although formal allotment management plans have not yet been implemented on the remaining eight allotments, Tomera Ranches, Stonehouse Division has informally been incorporating grazing practices designed to improve the health of some riparian and uplands areas by periodically delaying grazing until after the critical growing season of upland grasses, and minimizing use during the hot summer season to allow riparian conditions to improve.

Surface water sources that support livestock grazing and agriculture within the area include the Humboldt River, perennially flowing creeks, springs, and seeps. Improved water sources include developed springs, stock wells, stock ponds, water pipelines, and troughs. Livestock generally congregate near these water sources. Cow-calf pairs, heifers, steers, and cows graze on residual forage and rangeland within the Study Area.

Reasonably Foreseeable Future Activities

Land uses related to livestock grazing would continue in the future although grazing of some portions of existing allotments would become temporarily restricted due to mine development. Livestock grazing is expected to continue at levels established on the various grazing allotments included in the Study Area. Short-term (typically 2 to 4 years) adjustments to livestock numbers are expected in response

to range fires which have impacted forage levels. Livestock water supplies affected by mine activities would be replaced in accordance with permit conditions for each mining operation.

The following project is proposed as part of the on-going livestock management program for the BLM Elko District Office, separate from mining-related activities:

- Pine Mountain Allotment – Evan Flat well or pipeline to provide livestock water on the uplands to improve distribution of grazing use and provide opportunities to reduce use on nearby riparian areas.

The following reasonably foreseeable actions have been identified through current scoping and/or planning to be considered and evaluated:

- Evaluation of rangeland health for all subject grazing allotments is planned over the next 5 years in conjunction with development and implementation of allotment management plans designed to attain standards for rangeland health and land use plan objectives.

Newmont would establish a program for developing water sources for livestock use in the vicinity of the Emigrant Project. These projects would be developed in conjunction with local grazing operators and the Elko District Office and include:

- Development of two springs (specific locations to be determined) including installation of a fence enclosure and piping a portion of the water to a nearby point outside the enclosure;
- Construct trough and pipeline system east of the proposed Project (specific site to be determined); and

**SEE FIGURE 4-1 GENERAL
CUMULATIVE EFFECTS STUDY AREA**

- Construct (fence) a cattle corridor east of the proposed Project to facilitate movement of cattle by different operators.

Water development and fencing projects would be located and constructed in accordance with *BLM Standard Operating Procedures and Resource Protection Measures Common to Public Land Grazing Management Projects* and are hereby incorporated by reference. Maintenance of water developments would be the responsibility of the livestock permittee. Implementation of these measures would allow improved livestock control and enhance progress towards attaining the Standards and Guidelines for Rangeland Health and allotment specific multiple use objectives.

WILDFIRES AND RESEEDING

Past and Present Activities

Over the last decade, the BLM Elko District Office averaged 150 fires per season that burned approximately 1,000,000 acres. **Figure 4-2** depicts cumulative burned areas for the period 1999 to through 2007. Effects of wildfire on environmental resources are described within the context of a defined Study Area for the respective resource.

A Fire Management Plan was developed by the BLM Elko District Office in 1998. The Plan addresses all potential wildfire occurrences and includes a full range of fire management actions, uses new knowledge and monitoring results to revise fire management goals, objectives, and actions, and is linked closely to land and resource management plans. In 2003, BLM issued a proposed Fire Management Amendment to the Elko Resource Management Plan which was intended to reduce adverse impacts through reduction of hazardous fuel loads and provide resource-focused response strategies and new procedural guidelines. The amendment identified fire prevention actions

such as, vegetation manipulation, fuels reduction, green strips, fuel breaks, and thinning that should be maximized through use of prescribed burning, mechanical, chemical, and biological (including grazing) treatments to reduce wildfire fuel hazards.

Following each wildfire event, BLM evaluates and develops appropriate Burned Area Rehabilitation plans to address specific resource concerns. The extent to which a burned area is reseeded is governed by variables which are evaluated on site specific basis, such as burn intensity, soil stability, and pre-burn conditions. Since 1999, wildfires have burned over 1.4 million acres in the Study Area of which 471,000 have been reseeded. Site evaluations following wildfire events determined that the remaining (unseeded) areas could rehabilitate naturally due to pre-fire vegetative conditions, elevation, precipitation zone, and site potentials. Areas that have been reseeded are shown on **Figure 4-3**.

Since 1992, public and private entities have worked to restore range habitat for wildlife and livestock on areas affected by wildfire. Restoration work during 2006 by BLM and Nevada Department of Wildlife (NDOW) included fencing burned areas to preclude livestock grazing and reseeded within the Study Area.

According the 2007 Fire Management Report as prepared by the Nevada Division of Forestry (NDF) - Western Region, 2007 represented the fourth largest fire season on record with 888 fires burning more than 890,000 acres of Nevada forest and rangelands (NDF 2008). The fire season of 2006 was the second worst fire season of record with over 1,254 fires burning more than 1.3 million acres (NDF 2007).

The BLM Elko District has fire suppression responsibility on 7.5 million acres. Assistance is also provided by numerous cooperating

agencies such as the Nevada Division of Forestry, U.S. Forest Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, and county, tribal, and municipal governments.

The Elko District Office's fire suppression organization currently employs approximately 70 employees, and consists of four stations (Elko, Carlin, Wells, and Midas), ten 4x4 heavy engines, three Fire Operations Supervisors, an Interagency Hotshot crew, an Air Attack plane, and a type 3 helicopter with Helitack crew. In addition to these suppression resources, the Elko Interagency Dispatch Center handles all-risk dispatch duties for five agencies, and an aggressive fuels management program implements both hazard fuels reduction and projects for resource benefit each year.

The organization is also responsible for all fire management activities for the Eastern Nevada Agency (ENA) of the Bureau of Indian Affairs. The ENA program supports several type 2 handcrews and camp support crews, and includes completion of vegetation management projects on Tribal and BIA lands in the area.

Reasonably Foreseeable Future Activities

Fire (prescribed burns and wildfire) will continue to be an important component of land management for public and private landowners. Prescribed burns will be used to reduce fuel load in selected areas of public land. Wildfires are expected to continue in the Study Area. Some of this acreage would likely include burning of areas previously burned and seeded.

STABILIZATION AND REHABILITATION PROGRAMS

Past and Present Activities

Habitat restoration projects implemented by BLM in the Dixie Creek drainage include a livestock grazing management plan in headwater

reaches and riparian pasture and enclosure fencing in the lower reaches. The El Jiggs Agreement for Livestock Management implemented in 1998 provided improved grazing management on about seven stream miles of public and private land in the upper portion of the Dixie Creek drainage, while a combination of enclosure and riparian pasture fencing in 1990 allowed improved management of approximately five miles of perennial stream on public land in downstream areas. Stream and riparian habitat conditions in managed areas along Dixie Creek are characterized by mostly stable streambanks and well established woody and herbaceous riparian plant communities. Beaver are also increasing in these areas, resulting in formation of quality pool habitat and increased retention and storage of water.

The Emigrant enclosure, constructed in the late 1980s, has resulted in some improvement of the spring and the associated riparian zone. However, problems with fence maintenance and subsequent use by livestock have affected the level of recovery.

Several springs, meadows, cottonwood and aspen stands have also been protected by fencing in the headwaters of the Dixie Creek drainage in the El Jiggs Allotment. Four projects, constructed since 2005 have resulted in improved riparian habitat conditions as well as regeneration of mature cottonwood and aspen stands.

A fish barrier on Dixie Creek, above the confluence with the South Fork of the Humboldt River, is scheduled for construction in 2008. The barrier would preclude all fish and aquatic life, including non-native salmonids, from accessing the LCT population in the headwaters of Dixie Creek. Non-native trout have the potential to jeopardize the native cutthroat population though hybridization and/or competition.

**SEE FIGURE 4-2 HISTORICAL FIRES –
1999 THROUGH JULY 2007**

**SEE FIGURE 4-3 RESEEDED AREAS
1999 - 2006**

Reasonably Foreseeable Future Activities

There are no reasonably foreseeable future stabilization and rehabilitation projects planned by BLM within the Dixie Creek watershed.

MINING AND MINERAL DEVELOPMENT

The Carlin Trend is a mineralized zone approximately 50-miles-long by 5-miles-wide in north central Nevada where multiple mining operations have been developed. Some activities described in this chapter are located proximal to the mining operations, and other activities are located in adjacent areas (**Figure 4-4**).

Past and Present Activities

Carlin Trend

Newmont initiated its mining activities in the North Operations Area at the Carlin open pit mine in 1965. The North Operations Area includes the North Area Leach Pad, and the Bootstrap, Blue Star/Genesis, Lantern, Carlin Pit, Pete Mine, and Bullion Monarch open pit mines, and the Leeville underground mine.

Activities in the South Operations Area have expanded periodically since production began in 1985. Facilities include the Gold Quarry open pit mine, waste rock disposal facilities, tailing impoundments, dewatering wells, and ancillary facilities. The North-South Haul Road connecting the North Operations Area with the South Operations Area was approved in 1993.

Polar Resources began mining operations at the Betze/Post Mine in 1974; the mine was acquired by American Barrick Resources in 1986 and subsequently became the Betze/Post open pit mine (McFarlane 1991). Barrick began

development of the Meikle underground mine in 1995, with processing occurring at the Betze/Post operation.

Ore processing in the Carlin Trend has included installation and operation of cyanide heap leach facilities, carbon-in-leach systems, milling of ore, and disposal of tailing. In addition, exploration projects involving drilling, trenching, and sampling are ongoing.

Changes in exploration and mining activity include advancement of exploration projects to active mining level (Barrick's Goldbug and Storm Projects, and Newmont's Pete and Chuckar Projects). Expansions have been made to the Known Deposit Areas (Newmont's Genesis, North Lantern, and Lantern #3 and Barrick's Dee Mine area).

Disturbance associated with mine development in the Carlin Trend is listed in **Table 4-1** and shown on **Figure 4-4**.

Emigrant and Rain Mines

Mining and mineral development activities have been ongoing in the Study Area including exploration, mining, and closure of the Rain deposit, exploration activity associated with the proposed Emigrant Project, and exploration activity at the Woodruff Project site (**Figure 4-4**).

Development of the Rain Mine began in 1988 and included an open pit, waste rock disposal site, tailing impoundment, mill facility, and heap leach pad. Total disturbance area for the Rain Mine is 961 acres. Mining operations ceased in 1998; leaching of ore placed on the leach pad is currently ongoing and will continue until economic recovery of gold ceases (estimated at five years). Reclamation has been initiated on the waste rock disposal facility, tailing impoundment, and portions of the ancillary facilities.

TABLE 4-1
Past, Present, and Reasonably Foreseeable Future Mining Activity in the Carlin Trend

Map ¹ Reference No.	Facility	Existing Disturbance ²		Future Activity ³	Comment
		Exploration	Mining		
1	Newmont/Great Basin Gold-Hollister/Ivanhoe	15	268	100	Foreseeable underground mine and facilities. Same location as Hollister Development Block Project and would go from underground exploration to underground mining operation.
2	Hecla-Hollister Development Block	51	-	-	
3	Halliburton-Rossi	-	408	300	Rossi mine expansion of Queen Lode and Sage Hen areas and may include expansion of exploration, open pits, and waste rock dumps.
4	Trio-Gold Corp. – Rodeo creek	42	-	-	
5	Barrick-Meridian JV-Rossi	51	-	-	
6	Barrick-Storm Underground	-	185	-	
7	Barrick – Arturo	-	-	100	Foreseeable future open pit gold mine. Development of a new open pit mine at the existing Dee Gold Mine.
8	Marigold – Dee Mine	-	1,315		
9	Centerra-Ren	30	-	100	Foreseeable underground mine.
10	Newmont-Bootstrap	-	1,900	-	
11	Barrick-Betze/Post , Meikle, Rodeo,Goldbug, (Mill & TSF transferred from Newmont)	233	7,882	1,180	Expansion includes enlargement of Betze/Post open pit and construction of tailing impoundment.
12	Newmont-Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch		2,958	43	Continued mining of the Genesis Area. Project includes open pit mining, sequential backfill and increased height of existing external waste rock facilities.
	Newmont-North Area Leach		1,426	100	Expansion of North Area Leach pad
	Newmont-Carlin Mine/Mill 1, Pete	255	3,673	-	
13	Newmont-Leeville	-	566	-	
14	Newmont Chevas	168	-	-	
15	Newmont – High Desert	164	-	-	
16	Newmont – Mike	48	-	100	Foreseeable future gold mine project
17	Newmont – South Operations Area	-	9,961	100	Expansion of Non-property Leach Pad and construction of Property Pad 2 in Section 18.
18	Newmont – Woodruff Creek	66	-	-	
19	Newmont - Rain	-	961	-	
20	Newmont - Emigrant	155	-	1,418	Proposed open pit mine, sequential backfilling, heap leach pad facility and waste rock dump; permitting in progress.
TOTAL		1,278	31,503	3,541	

¹ See **Figure 4-4** for disturbance sites.

² Projects permitted by BLM as of April 2007

³ Reasonably foreseeable assumes 100 acres disturbance per plan or plan amendment. Actual disturbance will vary as plans are developed.

Source: BLM 2008.

**SEE FIGURE 4-4 PAST, PRESENT AND
REASONABLY FORESEEABLE MINING
ACTIVITIES – CARLIN TREND**

Exploration activity at the Emigrant Project has included drilling and trenching used to investigate the ore body. Permitted disturbance for exploration activities totals 155 acres and includes access roads, drill pads, trenches, and soil stockpiles/berms. Portions of the disturbance area have been reclaimed including contouring roads and drill pads and replacement of soil followed by seeding.

Activity at the Woodruff Exploration Project includes road building, drilling, and trenching. Total permitted disturbance acreage is 66 acres. The Woodruff Exploration Project is an ongoing exploration project.

A Plan of Operations for the proposed Piñon Project was submitted to BLM and NDEP in 2006 by Royal Standard Minerals, Inc. In 2007, BLM determined that the application was incomplete and would need to be resubmitted. Two technical reviews of the Plan of Operations were conducted by NDEP with no response from the applicant. Subsequently, NDEP voided the application.

Sand and Gravel Operations

Approximately 395 acres of private land have been disturbed by sand and gravel operations in the Carlin area. These operations generally lie adjacent to major transportation routes (Interstate 80 and State Highway 766) in the area and have been used to support construction and maintenance of area roads over an extended period of time (Newmont 2007c).

Reasonably Foreseeable Future Activities

Mine development and exploration projects are expected to continue in the foreseeable future in the Carlin Trend. Two of the larger operations include Barrick's Betze/Post pit and Newmont's Emigrant Project. Expansion of Barrick's Betze/Post pit would involve enlarging

the existing open pit, continuation of dewatering activities through 2015, and construction of a tailing storage facility. Newmont's proposed Emigrant Mine Project would include an open pit mine, heap leach facility, waste rock dumps, and ancillary facilities located about 20 miles south of Carlin. Newmont has also proposed expansion of the Genesis open mine pit and development of the Bluestar Ridge open mine pit in the Genesis-Bluestar Operations Area. Reasonably foreseeable mining operations in the Carlin Trend from 2008 through 2020 are shown on **Figure 4-4** and detailed in **Table 4-1**.

In addition to development of the proposed Emigrant Project, future mine development could include the Woodruff project which is currently in exploration phases. The components and extent of mining activity at this site is unknown at this time; it is assumed that mining would result in an open pit, waste rock disposal and heap leach facilities, and ancillary facilities to support development.

Closure activities at the Rain Mine would continue. Mining ceased at the Rain Mine in 2002 and only solution collection and disposal is ongoing. Remaining reclamation activities include evaporation of treated process solution, and regrading and revegetating the tailing impoundment. Final reclamation of the Rain Mine is expected to be completed by 2030.

RECREATION

Past and Present Activities

Outdoor recreational areas and facilities in the Project area include those managed by BLM that provide diverse recreational activities, including sightseeing, hunting, cross-country skiing, horseback riding, photography, cross-country motorcycle racing, rock hounding, and off-highway vehicle use. No developed recreation sites exist within the general Project area or

Study Area. Primary use of public land is associated with hunting and off-highway vehicle (OHV) recreation.

Reasonably Foreseeable Future Activities

The two primary recreational activities occurring in the Study Area are off-highway vehicle use and hunting. These activities would likely continue at current levels through the foreseeable future although access to areas within the immediate vicinity of the proposed Emigrant Project would be limited.

BLM is currently building a California trail interpretive center located at the Hunter exit on Interstate 80, about 6 miles west of the town of Elko. The center will encompass 40 acres and include a building, access road, interpretive plaza, 65-car parking lot, 1.5-mile walking trail, amphitheater, and day use area. BLM estimates approximately 65,000 people/year will visit the center once all exhibits are in place by 2010 (Jamiel 2007).

LAND DEVELOPMENT – URBANIZATION

Past and Present Activities

Platting of residential subdivisions in Elko County has primarily occurred through subdivision of land previously used for agricultural purposes. Numerous subdivisions platted in the 1960's, prior to N.R.S. subdivision law, did not provide legal access, roads, or utilities. Many of these subdivisions to date have not been developed or are developing at a slower rate. Most residential development has occurred within the incorporated boundaries of Elko and the surrounding areas, such as Spring Creek, South Fork, Lamoille, areas directly adjacent to the City of Elko, or along the Interstate 80 corridor (Elko County Nevada Water Resource Management Plan 2007).

Approximately 565 acres have been platted for development in the vicinity of Carlin. The majority of platted area lies between Interstate 80 and the Humboldt River in and adjoining the town of Carlin. Other development is occurring east of Highway 766 near its intersection with Interstate 80 (Newmont 2007c).

Approximately 23 acres have been platted at Palisades, midway between Carlin and Dunphy. Development in the Dunphy area consists of approximately 6 acres (Newmont 2007c). Information concerning the level and stages of these developments is not available.

Reasonably Foreseeable Future Activities

Land development in the Carlin-Dunphy area would likely continue commensurate with population and employment increases in the area.

OIL, GAS, AND GEOTHERMAL LEASES

Past and Present Activities

Elko District Competitive Oil and Gas Lease sales are conducted quarterly, in March, June, September, and December. Parcels proposed for lease are posted on the Nevada BLM website (www.nv.blm.gov) 45 days prior to the sale date. The last geophysical survey for oil and gas in the Study Area occurred in 2006. Tracts currently leased for oil and gas in the vicinity of the proposed Emigrant Project are shown on **Figure 4-5**.

Reasonably Foreseeable Future Activities

Leasing parcels for oil and gas is expected to continue in the future as energy demand continues to increase. No exploration or development permit applications for projects in the Study Area have been submitted to BLM.

**SEE FIGURE 4-5 OIL, GAS AND
GEOTHERMAL LEASE AREAS**

Future oil and gas development may create surface disturbance, which will be analyzed when a lessee submits plans for the action (BLM 2006).

HAZARDOUS / SOLID WASTE AND HAZARDOUS MATERIALS

Past and Present Activities

Hazardous Waste

The SOAPA and Barrick/Betze projects currently operate as Large Quantity Generators of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). These facilities generate more than 1,000 kilograms per month of RCRA-regulated hazardous waste (40 CFR Part 260-270). All hazardous wastes currently generated at the mines are managed according to existing, approved permits or are

disposed of according to local, state, or federal regulations.

Hazardous waste streams associated with mining and ore processing in the Carlin Trend are shown in **Table 4-2**. These wastes are accumulated and stored at designated sites at each mine operation and periodically transported to one of two Clean Harbors Treatment, Storage, and Disposal (TSD) facilities in Utah. All hazardous wastes are stored, packaged, and manifested in compliance with applicable federal and state regulations.

Solid Waste

All non-hazardous solid waste generated through operations in the Carlin Trend is disposed in NDEP approved Class III waived landfills established at the mine sites.

TABLE 4-2 Hazardous Waste Stream Carlin Trend Operations				
Stream	Generator	EPA Hazardous Waste Code	Treatment, Storage, Disposal Facility	Generation Rate
Newmont Operations				
Paint-related material	Mill 6	D001, F003	Clean Harbors by Incineration	1,100 gals
Mercury PPE/debris	Mill 6	D009	Clean Harbors by HW Landfill	31,600 lbs
Spent MIBK	Assay Lab	D001, D002	Clean Harbors by Incineration	350 lbs
Mercuric/Mercurous chloride	Mill 6	D009, D002	Air Pollution Control on Roaster in HW Landfill	42,000 lbs
Mercury Solids	Mill 6	D009	Clean Harbors by HW Landfill	4,000 lbs
Solvents	Mills, Leach	D001, F003	Clean Harbors by Incineration	1,100 gals
Hydrochloric, Sulfuric acid	Mills, refinery	D002	Clean Harbors by Incineration	5,000 lbs
Caustic solutions	Mills	D002	Clean Harbors by HW Landfill	2,000 lbs
Lab packs	Mills, Lab	Varies	Clean Harbors/varies	500 lbs
Lead-bearing waste	Assay Lab	D008	Clean Harbors by HW Landfill	25,000 lbs

**TABLE 4-2
Hazardous Waste Stream
Carlin Trend Operations**

Stream	Generator	EPA Hazardous Waste Code	Treatment, Storage, Disposal Facility	Generation Rate
Halogenated oil	Mills	F002	Clean Harbors by Incineration	3,000 gals.
Vanadium pentoxide catalyst	Mill 6	D009	Clean Harbors by Incineration	28,500 lbs
Barrick Operations				
Aerosol can waste, filters, paint filters	Property wide	D001, D005, D008, D018, D029, D035, D039, D040, F002, F003, F005	Clean Harbors by Incineration	1,440 lbs
Waste paint and related material	Property wide	D001, D004, D007, D008, D009, D039, F002, F003, F005	Clean Harbors by Incineration	1,120 lbs
Debris contaminated with used oil and tetrachloroethylene	Property wide	D039	Clean Harbors by Incineration	240 lbs
Inorganic lab waste	Lab	D008	Clean Harbors by Incineration	92.82 tons
Computer equipment	Property wide	D008	Clean Harbors/Metal recovery including retorting, smelting, chemical	17.11 tons
Baghouse dust from assay lab	Lab	D008	Clean Harbors by HW Landfill	5.07 tons
Brick, mortar, and soil	Autoclave	D008	Clean Harbors by HW Landfill	9.59 tons
HEPA filters and debris	Processing and Refining	D008	Clean Harbors by HW Landfill	7.12 tons
Used oil	Property wide	D039, D040	Clean Harbors by Incineration	17.5 tons
Used solvent	Property wide	D001	Clean Harbors by Incineration	440 lbs
Waste lead/acid batteries	Property wide	D002, D008	Clean Harbors by other treatment	400 lbs
Lead contaminated sandblast grit	Property wide	D008	Clean Harbors by HW Landfill	4.5 tons

EPA - Environmental Protection Agency; TSDF = Treatment, Storage, or Disposal Facility; gals = gallons; lbs = pounds; PPE = Personal Protection Equipment; HW = Hazardous Waste; MIBK = Methyl Isobutyl Ketone.

¹ Laboratory Clean-out Chemical Wastes

Source: BLM 2002a; BGMi 2006; Newmont 2007d.

Hazardous Materials

A compilation of hazardous materials stored in the Carlin Trend was obtained from the Nevada Fire Marshall's office and is contained in the SOAPA Draft Supplemental EIS (BLM 2007b).

The records included are for individual facilities in the Carlin Trend and represent the annual maximum volume of these materials that can be stored. Hazardous materials used and stored on-site in the Carlin Trend are shown in **Table 4-3**.

Reasonably Foreseeable Future Activities

Solid and Hazardous Waste

Reasonably foreseeable projects in the Carlin Trend would result in similar volumes of solid and hazardous wastes stored on site, transported on state and federal highways, and disposed of at approved sites. The volumes of solid and hazardous wastes transported are expected to remain at current levels (see *Past and Present Activities*).

Production levels for mills and heap leach operations are expected to be optimized for the foreseeable mine expansions and developments. As a consequence, the volume of hazardous materials transported, stored, consumed, and disposed would remain at current levels. Portions of Gold Quarry operations that remain to be built would not

result in a change in the volume or type of solid or hazardous materials currently being used in SOAPA operations.

Hazardous materials and waste associated with Great Basin Gold's Hollister Development Block have not been determined. Mine planning is ongoing and the amount of hazardous materials that would be used in this development is contingent upon the options selected for processing ore including location, and ore processing method (mill, heap leach, custom processing).

Expansion of Barrick's Betze operations would extend the life-of-mine. Production of ore and use of hazardous materials would remain at current levels.

TABLE 4-3
Hazardous Materials Used and Stored
Carlin Trend

Substance	Newmont		Barrick		Hecla Ventures Corp.	
	Annual Use	Stored On-site(s)	Annual Use	Stored On-site(s)	Annual Use	Stored On-site(s)
Diesel Fuel	19,409,502 gal.	84,000 gal.	16,599,189 gal	85,000 gal.	20,000 gal.	30,000 gal.
Gasoline	560,360 gal.	20,000 gal.	376,539 gal.	10,500 gal.	1,000 gal.	NA
Hydraulic Oil	571 gal.	3,000 gal.	NA	NA	NA	NA
Motor Oil	483 gal.	1,500 gal.	41,000 gal.	NA	NA	NA
Antifreeze	1,537 gal.	480 gal.	45,000 gal.	27,000 gal.	NA	NA
Explosives	-	25,000 lb.	NA	NA	30,290 lb.	NA
Prill	12,437 tons	495 tons	18,731 tons	217 tons	NA	NA
Propane	340,423 gal.	200,075 gal.	17,521,843 gal.	2,705,854 gal.	220 gal.	NA
Grease	-	2,400 lbs	NA	NA	NA	NA
Cyanide	18,224,795 gal.	75,000 gal.	10,508,640 lb.	580,010 lb.	NA	NA
Lime	112,354 tons	1,502 tons	290,657 tons	4,150 tons	NA	NA

gal. = gallons; lb. = pounds; NA = Not Available

Source: Newmont 2007e; BGMI 2007.

RESOURCES AND RESOURCE USES

GEOLOGY AND MINERALS

Effects of mining on geology, paleontology, and mineral resources include the excavation and relocation of rock materials from the natural setting. Ore rock is processed in mill facilities or placed on heap leach pads, and waste rock is placed in disposal facilities. In some cases, waste rock is used in construction of roads, leach pad foundations, ditch systems, stockpile areas, and backfill. Movement and disposition of rock materials (volume and location) varies by mine operation. Paleontological resources also could be impacted cumulatively if such resources occur in the Study Area. Formation of acidic leachate and subsequent release of trace metals could result in additive or cumulative effects on groundwater or surface water if conditions conducive to these phenomena are present.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for geology and mineral resources incorporates existing and reasonably foreseeable mining activity in the Carlin Trend through 2020. The Study Area includes the proposed Emigrant Mine, existing Rain Mine, and exploration activities at the Woodruff site located in the southern extent of the Carlin Trend and extending to the Hollister Development Block in the northern end of the Carlin Trend (see **Figure 4-4**).

Cumulative Effects

Ongoing and future mine development would result in expansion to and creation of open pits, waste rock disposal areas, heap leach pads, tailing storage facilities, and/or ore processing facilities. Future exploration may also result in delineation of more refractory ore zones that may require greater mining depths to recover

ore. The total volume of ore, waste materials, and gold that could be economically excavated in the future is not quantifiable as the price of gold and individual ore body characteristics dictate whether any particular mineralized zone could be economically mined.

Potential for acid generation and release of trace metals are the primary issues associated with excavation and disposal of rock material in the mining process. Early mining activity in the Carlin Trend focused on excavation of oxidized rock (rock with low sulfide content). These rocks exhibit low potential to generate acid and release trace metals because most of the sulfide minerals have been leached out of the rock. Later stages of mining in some operations have resulted in excavation and processing of refractory or sulfidic ore and waste rock. These rock materials have a greater potential to generate acid and release trace metals to the environment. As a consequence, specific mining methods, rock handling procedures, ore processing methods, and mitigation measures, have been implemented to manage potential acid generation and release of trace metals from these rock types to the environment. When these mitigation measures are successful, adverse impacts are minimal and localized, resulting in little or no cumulative effects. If acid conditions and/or increased metal loading occur to groundwater or surface water, cumulative effects could result.

Characteristics of rocks that would be excavated at any mine development are site specific. Since no mine plan has been accepted for the Piñon Project, it is not possible to quantify the potential trace metal or sediment release contribution of mine development at this project site (see *Water Quantity and Quality* section in this Chapter).

The Woodruff Project is an ongoing exploration project. Information is not available to characterize impacts from geological resources from this project at this time.

The nearby Rain Mine has the following percentages of waste rock types: oxidized Webb siltstone = 75 percent; oxidized Devils Gate limestone = 10 percent; and unoxidized Chainman/Fresh Webb siltstone = 15 percent (Harris 2005). The amount of unoxidized potentially acid generating waste rock at the Rain Mine (15 percent) is greater than what is expected for the Emigrant Mine (1 percent); the amount of Devils Gate limestone waste rock at Rain (10 percent) is less than what is expected at Emigrant (32 percent). As a result, some acid drainage has occurred from the Rain Mine Waste Rock Dump. Overall mineralogical and lithological composition of the rock types at Rain Mine is similar to Emigrant, with the exception of higher barite content at Rain (Harris 2005).

Potential cumulative effects associated with excavation, processing, and disposal of rock as a result of mining operations are primarily changes in water quality in groundwater and/or surface water that would receive trace metals released from rock. Cumulative effects of mining on water quality are described in the *Water Quantity and Quality* section of this Chapter. Cumulative effects of mining on water resources in the Carlin Trend are described in the SOAPA Draft Supplemental EIS (BLM 2007b) and Leeville Draft Supplemental EIS (BLM 2007c).

Visual resources and wildlife resources are also cumulatively affected by mining. Construction of haul roads, waste rock disposal facilities, heap leach pads, mine pits, and ancillary mine facilities affect these resources. See *Visual Resources* and *Wildlife Resources* for a description of the potential cumulative effects on these resources.

If paleontological resources are discovered at the Emigrant Project site, project activities would cease until a program can be implemented to recover or record the discovery. For those resources that are inadvertently damaged during mining, impacts could be cumulative with respect to other possible impacts from mine-related activities in the Study Area. The cumulative effect of mining in the Carlin Trend is not expected to result in loss or destruction of fossils; this region of Nevada is not known for paleontological resources.

AIR QUALITY

Air pollutant sources within the Study Area include existing mine closure operations and other background sources. Emissions from mine closure activities include criteria air pollutants such as particulate matter less than 10 microns (PM₁₀), particulate matter less than 2.5 microns (PM_{2.5}), and gaseous emissions (nitrogen oxides, sulfur dioxide and carbon monoxide). Background emission sources include traffic on unpaved roads, windblown dust, and agricultural activities.

Cumulative Effects Study Area

The State of Nevada has divided the state into 250 air quality planning areas based on hydrographic basins. The Cumulative Effects Study Area (Study Area) for air resources focuses on the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Air Quality Basin No. 48, Elko Segment Air Basin No. 49, and the northern portion of Pine Valley Air Basin #53. The proposed Emigrant Project lies entirely within Basin No. 48 (see *Water Quantity and Quality* section of Chapter 3 for a description of the hydrographic basins).

Rationale for selecting the aforementioned Air Basins for the cumulative effects investigation is based on previous air quality modeling for

regulated air pollutant sources conducted for the NDEP air quality permit process at the existing Rain and proposed Emigrant mines. Air modeling has shown that air pollutant concentrations are localized near project boundaries, and modeled air pollutant concentrations diminish rapidly with distance from project boundaries. There are no air pollutant emission sources located closer than 7 kilometers (km) from the outer boundary of the air quality basin. Based on previous air pollutant modeling, 7 km was judged to be sufficiently large that only other past, present, and reasonably foreseeable future emission sources in an air quality basin needed to be modeled to determine potential for cumulative air quality impacts (BLM 2007b).

Cumulative Effects

No other potential air pollutant sources are located within the Pine Valley and Elko Segment Air Quality basins, and the Dixie Creek watershed portion of Air Quality Basin No. 48. Cumulative effects to air resources are limited to those previously discussed under the Proposed Action.

Processing of metal laden carbon containing gold from the Emigrant Project would be conducted at Newmont's South Operations Area facilities. Mercury emissions associated with that facility are described in Chapter 3 – *Air Quality*. The potential cumulative effects of mercury emissions from sources within the Carlin Trend have been disclosed in the SOAPA Project Draft Supplemental EIS (BLM 2007b) and Leeville Project Draft Supplemental EIS (BLM 2007c). Newmont is *compliant with all requirements of the Nevada Mercury Air Emission Control Program* at its facilities in the Carlin Trend. Air modeling completed for the SOAPA and Leeville Draft Supplemental EISs indicated that there is little to no overlap or combination of air quality impact from sources within the Carlin Trend and therefore, cumulative impacts

are sufficiently small as to be below measurement thresholds. No ambient air quality standard has been adopted for mercury.

WATER QUANTITY AND QUALITY

Cumulative effects on water resources can occur from mining and mineral development, grazing, wildfires, recreation, and other land development activities. Contribution of sediment from disturbed land to streams, and potential acid generation and/or release of trace metals from newly exposed rock could occur as a cumulative effect if conditions conducive to these phenomena are present in the Cumulative Effects Study Area.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for water quantity and quality encompasses surface water and groundwater in the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48 as shown on **Figure 4-6**. The Study Area includes the proposed Emigrant Mine, a portion of the Rain Mine (waste rock pile adjacent to mine pit), and exploration activities at the Woodruff site located in the southern extent of the Carlin Trend. The proposed Emigrant Project lies entirely within Basin No. 48, with groundwater and surface water moving within this watershed from the Emigrant Project site.

Cumulative Effects

Future mine development in the Study Area could result in creation of open pits, waste rock disposal areas, heap leach pads, tailing storage facilities, and/or ore processing facilities. Potential impacts to groundwater and surface water quantity, including springs, are not predicted for the Emigrant Project, primarily due to depth to groundwater and the intermittent/ephemeral nature of surface water

**SEE FIGURE 4-6 CUMULATIVE
EFFECTS STUDY AREA FOR
SELECTED RESOURCES**

flow in the area. As stated previously, current data are insufficient to predict potential effects that the Woodruff Exploration project would have on groundwater and surface water quantity because mine plans have not been submitted for this property.

Mine-related activities would affect topography, which in turn, may result in increased erosion and sedimentation. Total extent of mining-related activities in the future is not quantifiable as the price of gold and individual ore body characteristics dictate whether any particular ore body could be economically mined and how it would be mined. The Emigrant Mine would incrementally add to alteration of topography associated with the Rain Mine and other potential future mining and mineral development projects within the Study Area (e.g., Woodruff Exploration Project).

Erosion of mine-related land disturbances can result in increased sedimentation to surface water bodies in the Study Area. All mine projects have storm water permits that incorporate best management practices (BMPs) to control erosion and capture runoff from disturbed areas. NDEP conducts regular inspections of sediment control systems to ensure compliance with storm water permits. Reclamation of disturbed areas during and after mining will manage potential long-term erosion and sedimentation from mine sites.

Wildfires and flooding have resulted in impacts to some riparian areas of the Dixie Creek drainage. These conditions generally result in increased erosion and sedimentation to the nearby surface water drainages. However, livestock grazing (particularly during the hot season on an annual basis) represents the single most important factor affecting water quality in the Dixie Creek drainage. Surface water quality impairments are specified in Nevada's 303(d) List.

Impacts to water quality within the Study Area also occur as a result of agricultural use. Grazing along stream corridors can result in a loss of bank stability, erosion, and sedimentation. Impacts to water quality include increasing suspended solids and turbidity, increasing temperature, decreasing riparian vegetation, and a variety of other effects. Diversion of water for irrigation also potentially impacts water quality by increasing water temperature, as well as introducing a number of agricultural contaminants via return flow. There are insufficient data to quantify non-point sources of potential water quality impacts, but often are addressed in the state's Section 303(d) water quality impairment program, including restoration of disturbed areas.

Other non-mining land uses such as recreation and transportation also contribute cumulatively to water quality impacts. These activities can add to surface disturbance which increases potential of erosion and sedimentation to surface water resources.

Water quality improvements due to stream and habitat restoration efforts are documented in monitoring programs and reports for the Study Area. Improvements, fencing, and expansion of riparian/wetland areas in the Dixie Creek drainage has occurred. An enclosure also has been constructed around Emigrant Spring; however, lack of maintenance has allowed access by livestock. Development of healthy, well-developed riparian zones typically has the benefit of slowing water movement and dissipating erosive energy during periods of high flow. This condition results in capture of sediment, development of floodplains, and overall habitat improvement.

Potential release of trace metals and sediment from development of ore bodies in the Dixie Creek watershed could result in additive effects to surface water and groundwater quality in the drainage. Mine-related facilities include waste

rock piles, leach pads, tailing impoundments, and process ponds. To date, a portion of one existing mine facility (reclaimed waste rock dump at the Rain Mine) could contribute trace metals to groundwater and/or surface water in the Dixie Creek drainage.

The Woodruff Exploration Project site is located outside of the Dixie Creek drainage and therefore is not expected to contribute effects to surface water resources in Dixie Creek. It is unknown whether any future development of the Woodruff Project would affect groundwater resources in Dixie Creek.

To date, with the exception of a waste rock disposal facility at the Rain Mine, none of the water monitoring stations in the Study Area has reported evidence of acid-rock drainage or elevated levels of metals. Conditions that create acid drainage typically are addressed through a combination of improved surface water control measures, and reclamation and re-contouring to maximize evapotranspiration and shedding of meteoric water.

The amount of unoxidized potentially acid generating waste rock at the Rain Mine (15%) is greater than what is expected for the Emigrant Mine (1%); and the amount of Devils Gate limestone waste rock at Rain (10%) is less than what is expected at Emigrant (32%). Overall mineralogical composition of the rock types at Rain Mine is similar to Emigrant, with the exception of higher barite content at Rain (Harris 2005).

Concentrations of total dissolved solids, sulfate, nitrate, and some metals may be elevated, at least in the short-term, for water that comes into contact with some mine pit walls. These water quality conditions can be quite variable, depending on local conditions, including rock type, mineral composition, exposure to weathering, amount of rock submerged below the water surface, presence of potentially acid-

generating rock, chemical equilibrium conditions, and pit lake turn-over (if present). For the Study Area, inflowing groundwater and/or surface water to mine pits typically have sufficient alkalinity to maintain neutral pH conditions for the long-term (*i.e.*, high buffering capacity). These conditions would be verified through ongoing groundwater and surface water monitoring in the vicinity of each mine site.

In the Dixie Creek Valley, existing production wells (previously used as makeup water supply to the Rain Mine) would be used to supply water for the Emigrant Project. Pumping rates for these wells are described in Chapter 2 - *Proposed Action*. Impacts to groundwater rights associated with wells may occur where water levels decline such that water yield is reduced or a pump must be lowered to keep it in water. Surface water rights can also be affected where groundwater is interconnected with surface water. Makeup water pumping rates for the proposed Emigrant Project would not exceed the rate of pumping used to support the Rain Mine. There is insufficient data to predict the level of potential cumulative effects to water rights that could occur from potential development of the Woodruff project. Water rights are administered by the State Engineer.

SOIL RESOURCES

Information on soil resources in the Study Area is developed on a project specific basis through soil surveys. Surveys include various levels of intensity depending on whether a specific tract of land is to be disturbed by proposed mine development. Soil survey information is described in Plan of Operations submitted by mine applicants and includes the texture of the soil, depth or thickness, chemistry (including organic matter content), coarse fragment content, aerial extent of each soil type (map), and suitability rating of the soil for reclamation.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for soil resources encompasses the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48. This Study Area is based on natural and manmade impacts to soil resources that result in soil movement or loss, soil fertility and productivity, and areas where additive effects of soil movement could impact other resources (e.g., surface water). The Study Area for Soil Resources is shown on **Figure 4-6**.

Cumulative Effects

Soil resources are cumulatively impacted through disturbance and/or removal by mining, fire, agriculture, recreation, and a variety of other natural and man-caused activities within the Study Area. Cumulative effects to soil resources from past, present, and reasonably foreseeable future activities in the Study Area include reclamation activities at the Rain Mine, construction and development of the proposed Emigrant project, mineral exploration at the Woodruff site, wildfires, and continued livestock grazing.

Mining and livestock grazing are expected to continue as major activities in the Study Area. Impacts from these activities include loss of soil productivity due to changes in soil physical properties, soil fertility, soil movement in response to water and wind erosion, and loss of soil structure due to compaction.

In addition to mining and grazing activities in the Study Area, wildfires create impacts to soil. Burned areas with damaged or destroyed vegetation are susceptible to soil erosion by wind and water. Emergency and remedial seeding has taken place in order to minimize soil erosion and stabilize surfaces. An undetermined amount of soil has eroded into drainages and waterways as a result of fire.

Movement of soil from burn areas is dependent on weather conditions, duration of exposure, and success of seeding efforts to re-establish vegetative cover.

Mine construction and development practices in the Study Area include salvage and stockpile of soil for use in reclamation. Topsoil stripping occurs immediately following clearing and grubbing of the surface area and therefore, the time period between exposure of bare mineral soil to wind and water erosion is minimized. Soil movement is most evident from stockpiles of soil prior to establishment of cover crops. Once cover crops are established, soil movement from the surface of stockpiles is minimized. Also, BMPs are used (including installation of berms at the toe of each stockpile) to collect soil that may move from the face of the stockpile. This soil is captured and is returned to the stockpile; resulting in minimal loss of soil.

Similarly, redistribution of soil during reclamation is a period of time where wind and water erosion can initiate soil movement. This time period is prior to establishment of vegetation on the reclaimed area. Standard practice in the mining industry is to use BMPs to control and minimize sediment movement until vegetation is established. Best management practices allow soil to be captured and returned to the reclaimed area minimizing soil loss.

Reclamation associated with past mining disturbance and future restoration activities would mitigate soil movement and productivity loss. Soil salvaged and used in reclamation would become viable and is expected to return to pre-mining productivity once vegetation is established. Seeding and revegetation of areas that have been burned will reduce soil movement and loss.

Data that quantify cumulative soil movement that result in soil loss in the Study Area from all land surfaces (mine areas, burn areas, grazing areas) are not available. As described above, soil movement in response to any of the land disturbing activities or natural phenomena (wildfire) are site specific, weather dependent, and subject to response to the timing and success of rehabilitation efforts.

UPLAND VEGETATION

The cumulative effects discussion for vegetation focuses on changes in dominant plant communities that effect habitat for wildlife (i.e., sagebrush/grasslands). Wildfires combined with displacement of native species by invasive annual grasses are the primary factors that have altered the structure, composition, and ecology of plant communities in the Study Area.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for vegetation encompasses the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48. (**Figure 4-6**). Impacts to vegetation (removal, wildfire, grazing) associated with land use activities in the Dixie Creek drainage could result in exposure of bare mineral soil which can be mobilized through water and wind erosion.

Cumulative Effects

Potential cumulative effects associated with loss or removal of vegetation within the Study Area is similar to those described for *Soil Resources* in this Chapter. The general effect in some areas of recent fires has been conversion of primarily sagebrush habitat to expanses of cheatgrass, which form a persistent, non-native, monoculture that dominates some burned areas. The continued establishment of cheatgrass will increase the likelihood of

wildfire, and could change the fire regime, community composition, and structure of plant communities indefinitely. Locally and regionally, wildfires have reduced the density of shrubs and trees. Many of the woody species in the area are slow growing, requiring 15 to 20 years to re-establish.

Reseeding programs within the Study Area will improve vegetation structure and composition in burned areas and benefit wildlife by providing forage, cover, and nesting habitat. Large areas affected by fire may take years to re-establish native vegetation. Completed and planned sagebrush and forage planting in burned areas will benefit a diversity of wildlife species including mule deer, pronghorn, sage grouse, and pygmy rabbit by providing forage, cover, and breeding habitat.

Livestock grazing has and will continue to influence vegetation composition and structure throughout the Study Area. Potential for overgrazing may increase as land is converted to mining and transportation uses or temporarily lost to wildfire; however, adjustment of stocking rates to account for changes in land use ensures vegetation communities are not overgrazed. Within the Study Area, reductions in permitted grazing use has and will continue to occur as a result of mine development and wildfires; however, these impacts will be short term as subsequent reclamation of mined areas and restoration of burned sites will allow for stocking rates to return to near pre-mining/pre-burn levels.

Invasive, Non-native Species

Cumulative effects on invasive and non-native species result from wildfire, livestock use, and mining disturbance in the area. Disturbed sites and recently seeded areas are candidates for invasion by undesirable species such as noxious weeds and cheatgrass. Aggressive revegetation

and weed control programs are being implemented to prevent establishment of weed infestations on reclaimed sites.

Special Status Plant Species

No plants listed as threatened or endangered under the Endangered Species Act of 1973 are known or have potential to occur in the Study Area (Cedar Creek Associates 1997). Habitat for nine sensitive plant species may be present in the Study Area. None of these species was documented in the Study Area during previous surveys (Cedar Creek Associates 1997; Westech 2004a). Based on the baseline information compiled to date, no cumulative effects on special status plants have been identified.

WETLAND AND RIPARIAN AREAS

The cumulative effects discussion for wetland and riparian areas focuses on sediment retention, habitat diversity for aquatic and terrestrial wildlife, and streambank stability.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for wetland and riparian resources encompasses the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48 (**Figure 4-6**).

Cumulative Effects

Sediment resulting from livestock grazing, fires, roads, and other factors of surface disturbance would increase sediment discharge to surface water drainages. Past, present, and future mine development would also reduce vegetation cover in wetlands, riparian areas, and on uplands. Although approximately 12 miles of stream and riparian habitat along Dixie Creek have been improved through changes in livestock grazing practices (refer to the

discussion under *Stabilization and Rehabilitation Programs* in this chapter), about 15 miles on private land remain in poor condition. Cumulatively, these factors degrade wetland and riparian areas, and lead to destabilization of streambanks. Restored areas along Dixie Creek, are characterized by highly functioning wetland and riparian communities that help reduce sediment load in the stream and amount of sediment reaching the South Fork Humboldt River.

Proposed sediment control actions that would be implemented at the onset of ground disturbance, including installation of surface water control structures, establishment of riparian vegetation in the engineered stream channel, and other BMPs, would reduce contribution of sediment from proposed mine development. These sediment control features would be maintained to ensure sediment loads from mine development would be minimized and not transported downstream to Dixie Creek and South Fork Humboldt River. Sediment control systems to be implemented at the Emigrant Project would also trap sediment from sources upstream of the proposed Emigrant Mine site; thus reducing the contribution from any existing sources upstream.

Historically, disturbances in wetland and riparian areas included fire and grazing and early mineral exploration and mining. These factors will continue to shape riparian communities in the Study Area. Riparian and wetland vegetation typically recover faster following fire than upland vegetation and therefore receives greater wildlife and livestock use while upland vegetation is recovering. Increased use in these areas can lead to overgrazing and introduction of invasive species.

Grazing will continue in the area despite changes in land use to mining operations. Local ranchers currently use springs for livestock

watering. This has caused degradation of the riparian areas, which would be reduced if enclosures are constructed, allowing natural recovery of the enclosed areas.

FISHERIES AND AQUATIC RESOURCES

Numerous impacts have been identified that can concurrently affect fisheries and other aquatic resources and riparian/wetland habitats. A number of the cumulative impact discussions presented in the *Terrestrial Wildlife* and *Wetland/Riparian Areas* sections also impact fisheries and other aquatic resources. The reader is referred to those sections in this chapter.

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for fisheries and aquatic resources encompasses the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48 (**Figure 4-6**). The geographic representation of this Study Area is based on the potential impacts that could result from the Proposed Action including changes in water quantity and habitat due to water diversion and water quality due to soil movement. Potential increases in sediment load to tributaries of Dixie Creek and Dixie Creek represent the geographic area to be analyzed for the Proposed Action and other land uses or natural phenomena that could impact water quality and therefore fisheries and aquatic resources.

Cumulative Effects

Potential reduction or loss of available water and long-term effects to the riparian and aquatic community in drainages in the Study Area would result in a loss of breeding, foraging and cover habitats; increased species mortalities; a reduction in overall biological diversity; possible genetic isolation; and possible long-term impacts to population numbers of some species.

Recovery of shallow groundwater and surface water sources would likely be gradual. Incremental habitat loss could affect fish and other aquatic resources. If reclamation and/or mitigation measures do not reproduce the pre-mine aquatic and riparian habitats, a net loss to the original aquatic resources would be expected. Depending on the post-mining reestablishment of shallow groundwater levels, surface water and aquatic habitats (e.g., seeps and springs) and land use, it is also possible to provide a net gain to fish and aquatic resources.

Sedimentation from roads, livestock grazing issues, and wildfire would act cumulatively with the Proposed Action to reduce stream shading, increase water temperature, and increase sediment delivery to Dixie Creek, its tributary channels, and possibly South Fork Humboldt River during periods of stream flow. For most of these drainages, flow occurs only during snowmelt runoff and major rain events. Exceptions include South Fork Humboldt River and a five-mile restored portion of lower Dixie Creek. Grazing and trampling in the drainage downstream from the proposed Emigrant Project could result in decreased aquatic habitat throughout its reach to the confluence with Dixie Creek and points farther downstream. Planned construction of a fish barrier in lower Dixie Creek to prevent upstream movement of nonnative salmonids from the South Fork Humboldt River would act cumulatively with short- or long-term changes in the Emigrant drainage which could disrupt fish movement and further isolate native fish populations in the Dixie Creek drainage.

Changes in water quality (increased temperature and sedimentation) could affect the aquatic community in several ways. Although the majority of fish species (non-game and warm water species) have adapted to periods of high sedimentation and warm temperatures, high sediment levels and increased temperatures for long durations may

cause some fish to avoid these areas. Most salmonids, as well as many other aquatic species, require habitat with little sediment. Suspended sediment can directly affect respiration of these species and an increase in embeddedness can reduce potential spawning habitat. Sediment increases can also negatively affect prey species (macroinvertebrates). Loss or reduction in populations of these prey-base species can be amplified through other species higher up the food chain.

TERRESTRIAL WILDLIFE

The cumulative effects discussion for wildlife emphasizes potential effects to mule deer and pronghorn antelope (important big-game animals) and special status species (e.g., threatened, endangered, candidate, and sensitive species) for which reductions in important habitats (primarily sagebrush-grassland) have affected populations within the Study Area. Other terrestrial species associated with sagebrush-grasslands that occur within the Study Area include small mammals, passerine birds, waterfowl, and raptors, as well as amphibians, reptiles, and invertebrates.

Cumulative Effects Study Areas

Mule Deer

The Cumulative Effects Study Area (Study Area) for mule deer encompasses Big Game Management Units 062, 064, 065, 067, and 068 all within NDOW Wildlife Management Area 6 as depicted in **Figure 4-7**. The Study Area was determined by BLM and NDOW and includes a contiguous area that provides crucial seasonal habitat for mule deer, a species of concern because of habitat losses associated with wildfires and mining. The Study Area extends from the northern end of the Independence Range in the North to the southern extent of Hunting Area 065 lying south of the Humboldt River.

Pronghorn Antelope

The Study Area for antelope only includes Big Game Management Unit 065 which encompasses the proposed Emigrant Project (**Figure 4-8**). Antelope do not cross the interstate highway with the frequency that mule deer do; consequently, the habitat available in Unit 065 is representative of the geographic area that NDOW considers to be the area of cumulative impact.

Special-Status Species

Special-status species are identified as those listed or proposed for listing as threatened or endangered under the Endangered Species Act of 1973 (ESA), species that are candidates for listing under the ESA, species that are on BLM's list of Sensitive Species and State of Nevada Listed Species. Nevada BLM policy is to provide Nevada BLM Sensitive Species and State of Nevada Listed Species with the same level of protection as is provided for candidate species in BLM Manual 6840.06C.

The Study Area for most special-status species and other terrestrial wildlife includes the Dixie Creek watershed portion of the Dixie Creek – Tenmile Creek Hydrographic Basin No. 48 (**Figure 4-6**). The Study Area for sage grouse encompasses over 725,000 acres in the western portion of the South Fork Population Management Unit as shown on **Figure 4-9**.

Cumulative Effects

Wildlife habitat affected by wildfire, mining, urbanization, and areas reseeded are shown in **Table 4-4**. Cumulative effects of these mine projects include a loss of habitat associated with disturbance of mine facilities and reduction or loss of flow in springs and seeps. In regard to nesting, breeding and/or foraging habitats for wildlife species that establish territories on intact areas, most habitats are already at their

respective carrying capacities and would not support any additional animals (BLM 2008b). Displaced individual or groups of animals would be lost from the population until habitat that provides seasonal use areas are rehabilitated, restored or mitigated, and allows population

expansions in to affected areas. The remaining wildlife species that do not establish territories would be concentrated within smaller intact habitat areas; habitat would be lost on those areas that are not eventually rehabilitated, restored, or mitigated.

TABLE 4-4
Wildlife Habitat Affected by Fire, Mining and
Areas Reseeded (acres)

Habitat Type	Habitat Available	Area Affected by Wildfire ¹	Area Included in Plan Boundaries ²	Percent of Total (Wildfire/Mining)	Areas Reseeded
Mule Deer³					
Crucial Winter	386,589	267,057	1,097	69/0.3	108,190
Intermediate	544,078	295,200	11,030	54/2.0	112,155
Low Density Use	1,061,856	415,338	47,352	39/4.5	160,026
Summer	994,862	191,633	695	19.3/0.07	54,666
Subtotal	2,987,385	1,169,228	60,174	39/2.0	435,037
Pronghorn Antelope⁴					
All Year	323,076	142,955	8,110	44/2.5	64,820
Crucial Winter	14,494	1,884	-	13/-	853
Low Density Use	24,184	8,028	-	33/-	623
Summer	266,705	107,322	12	40/-	35,408
Subtotal	628,459	260,189	8,122	41/1.3	101,704
Sage Grouse⁵					
Nesting/Brood Rearing	518,256	167,654	4,808	23/0.6	78,403
Other	208,314	67,207	765	9.2/0.1	16,812
Subtotal	726,570	234,861	5573	32.3/0.7	94,855
Community Type	Other Wildlife Species⁶				
Sagebrush/grassland	102,955	38,446	4,163	37/4.0	15,176

¹ For period of 1999 through 2007; ²Includes past, present, and reasonably foreseeable future mining activity; ³ As shown on Figure 4-7; ⁴ As shown on Figure 4-8; ⁵ As shown on Figure 4-9; ⁶ As shown on Figure 4-6.

Successful reclamation of all mine related disturbances in the Carlin Trend area would result in a mosaic that would differ from pre-mining conditions, including undisturbed pre-mining habitats and a variety of reclaimed habitats (BLM 1993). Reclamation of areas disturbed by the Proposed Action would result in rehabilitation of wildlife habitat. The degree to which reclamation would replace habitats affected by mining would depend on species

composition and structure of post-mining habitats. Reclaimed habitats likely would have a higher density of grasses than pre-mining habitats. Reclaimed habitats for different sites would provide variable topography, combinations of native and introduced plants, younger age class of shrubs and patches of vegetation that were not present before mining but would be beneficial to wildlife.

**SEE FIGURE 4-7 VEGETATION
RESOURCES**

**SEE FIGURE 4-8 MULE DEER HABITAT
CUMULATIVE EFFECTS STUDY AREA**

**SEE FIGURE 4-9 PRONGHORN
ANTELOPE HABITAT CUMULATIVE
EFFECTS STUDY AREA**

Mule Deer

Many of the predictions for impacts associated with mining activities that were presented in previous EIS documents within the Carlin Trend (e.g., BLM 2000, 2002a, 2002b) remain viable since final reclamation, existing/future dewatering activities, and other mitigation measures have not been completed. For example, continued, long-term cumulative dewatering impacts are currently uncertain for surface water, even though impacts to date have been minimal. Short-term mitigation measures have been successful in reducing impacts and resulting in improvements (e.g., riparian enhancements that improve associated wildlife habitat availability and stream stabilization/sediment reduction in some area streams), and continued improvements to ongoing and planned mitigation and monitoring programs will help to minimize long-term impacts.

Pronghorn Antelope

Big Game Management Unit 065 encompasses approximately 628,000 acres. Cumulative effects to antelope and associated habitat in this area have resulted primarily from past wildfires, mineral exploration and mining activities, ranching operations such as livestock grazing, drought and seeding of native range by introduced herbaceous species.

Habitat losses resulting from operations at the Rain Mine and proposed Emigrant Project would reduce capacity of the Study Area to support pronghorn and other species dependent on habitats that are difficult to re-establish through reclamation (e.g., juniper, big sagebrush, and other shrubs). Quality of winter range for antelope is determined by the composition of sagebrush and other shrub species.

Sage Grouse

Cumulative effects to sage grouse and associated habitat have resulted primarily from past wildfires, ranching activities such as livestock grazing, drought, and seeding of native range with introduced herbaceous species (e.g., crested wheatgrass).

Over the past two years an estimated 76 sage grouse leks have been lost in northern Nevada due to fires. From 1999 through 2007, wildfires in the Study Area (Population Management Unit) area altered over 32 percent (about 235,000 acres) of sage grouse habitat, substantially reducing amounts of sagebrush and other species sensitive to effects of burning. About 168,000 acres (23 %) of areas burned within the Study Area during that period was important nesting and brood rearing habitat. The quality of sage grouse habitat is determined by the density and age of big sagebrush.

Data describing population trends for sage grouse in the Study Area are limited but show increases in the number of known and active leks from 2005 to 2006 (**Table 4-5**). Information from the Nevada Sage Grouse Conservation Project however, states that population estimates derived from lek counts conducted in 2007 show declines within the South Fork Population Management Unit, but no data are available to support this statement (NDOW 2008).

TABLE 4-5
Sage Grouse Population Trends
South Fork Population Management Unit

Year	Known Leks	Active Leks	Population Estimates	
			Low Estimate	High Estimate
2004 ¹	-	-	2,288	2,745
2005 ²	46	23	4,324	5,189
2006 ²	57	35	6,507	7,809

Source: ¹ Northeastern Nevada Stewardship Group, Inc. 2004; ² NDOW 2008.

Other Special Status Wildlife Species

Pygmy Rabbit (Sensitive Species)

Pygmy rabbits are sagebrush obligates that prefer areas of relatively tall, dense sagebrush with deep soil suitable for excavating burrows. Sagebrush is the primary food of pygmy rabbits, but they also eat grasses and forbs depending on the seasonal availability. In Nevada, pygmy rabbits are generally found in sagebrush-dominated broad valley floors, stream banks, alluvial fans, and other areas with friable soil.

Preble's Shrew (Sensitive Species)

Preble's shrews occupy a diversity of habitats including wetland and marshy habitats with emergent vegetation and woody species. Mine dewatering could cause springs to dry or become smaller, which could reduce potential habitat for Preble's shrew. Widespread wildfires have altered and would continue to alter habitat for this species.

The following Sensitive Species are reliant on water sources for direct life support and/or prey base:

- Bald eagle;
- Preble's Shrew;
- Swainson's Hawk;
- White-faced Ibis and Black Tern;
- Ferruginous Hawk;

- Northern Goshawk;
- Burrowing Owl;
- Bats;
- Logger Head Shrike; and
- Nevada Viceroy.

Details regarding the type of habitats and prey base for these species are described in Chapter 3. Cumulative effects to these species are not anticipated as water sources in the Study Area would not be affected.

Other Terrestrial Wildlife

Habitat in the Dixie Creek watershed (Study Area) is dominated (90%) by sagebrush/grassland habitats. Wildfires in the watershed have altered 38,446 acres (34%) of wildlife habitat. These fires have resulted in loss or alteration of forage, foraging areas, and cover for wildlife. Wildlife in the area may be displaced, avoiding areas once inhabited due to the loss or alteration of forage and cover. In addition, starvation or other negative effects associated with the lack of forage and cover may occur, especially during winter months (BLM 2007b).

Mineral Exploration and Mining Activities

The expanded use of cyanide leaching operations could result in the potential for increased mortality of species such as birds and small mammals. Cumulative impact concerns

with exposure to cyanide solutions would involve such events as regional impacts on migratory birds and other rare or uncommon species. However, impacts to wildlife are minimized through access control or rendering potential toxic materials harmless to wildlife. Over the years, NDOW and the mining industry have coordinated efforts to reduce direct mortality of wildlife at mine sites, especially losses resulting from cyanide or other types of chemical poisoning. The mine operators and NDOW have worked together since 1990 to implement a regulatory program to prevent wildlife mortality at heap leach ponds and mine tailings (e.g., Industrial Artificial Pond permit program). Industrial Artificial Pond Permits required for facilities such as heap leach facilities required controls such as: a) fencing to preclude access by terrestrial wildlife; covering/containment for bodies of water containing a potentially lethal chemical in order to preclude access by birds and bats; and chemical neutralization or isolation of any chemical-laden fluids in a pond too large to cover or contain, in order to render the fluids non-lethal to wildlife.

Successful reclamation of mining related disturbances will result in a mosaic that would differ from pre-mining conditions, including undisturbed pre-mining habitats and a variety of reclaimed habitats (BLM 1993). The degree to which reclamation would replace habitats destroyed by mining would depend on species composition and structure of post-mining habitats. Reclaimed habitats likely would have a higher density of grasses than premining habitats. Reclaimed habitats for different sites will provide variable topography, combinations of native and introduced plants, younger age class of shrubs, and patches of vegetation that were not present before mining.

Some wildlife species may not regain their pre-mining distribution and density, while others (present in limited numbers and distribution before mining) may benefit from reclaimed habitat. However, successful mitigation measures and BLM/NDOW and private entity monitoring and mitigation activities in the region (e.g., grazing allotment and wildlife enhancement projects), would minimize short- and long-term impacts. Depending on the post-mining land use, it is possible to provide a net gain to wildlife if reclamation is successful.

Livestock Grazing and Land Alterations

Impacts from livestock grazing, in combination with wildfire and vegetation conversion (crested wheatgrass seedings) have adversely affected wildlife habitat in the respective resource Study Areas. NDOW has focused its efforts on areas prioritized for wildlife values. Restorative efforts including seedings, weed treatments, greenstrips, reforestations and control of grazing in riparian areas have improved wildlife habitat (Burton and Lamp 2005).

Critical areas for wildlife have and are being reseeded using a variety of methods. Such land would be reseeded with forbs, grasses and shrubs that can compete with invasive grasses such as cheatgrass, which is prevalent in northern Nevada. Cheatgrass chokes out native vegetation, matures and dries out early in the summer, fuels wildfires and continues the cycle of habitat destruction.

Wildfires

Habitat in the Study Area is dominated (>80 percent) by sagebrush/grassland habitats (Burton and Lamp 2005). Wildfires have resulted in impacts to wildlife such as loss or alteration of forage, foraging areas and cover. Wildlife in the area may be displaced, avoiding areas once inhabited due to the loss or alteration of forage and cover. Migration routes

may have shifted. In addition, starvation or other negative effects associated with the lack of vegetation for forage and cover may occur especially during the winter months (BLM 2007b).

Fires have negatively impacted sagebrush-associated species' habitat in the short to mid-term (5-15 years), due to loss of sagebrush canopy cover and vertical structure for nesting and cover. Diversity of forb and grass communities on cheatgrass dominated areas remains limited which also negatively impacts sagebrush obligates and associated species. Conversion of extensive areas of shrub steppe in the Study Area by fire to large expanses of burned area, dominated by exotic grass species, has reduced the prey base and nesting habitat for numerous sagebrush associated species. Seeding projects have reestablished forage for certain species; however, in some cases, reseeded areas have burned in later years after vegetation had become established.

RECREATION

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for recreation covers the administrative area of the Elko District Office as shown on **Figure 3-12**. The administrative area of the Elko District Office encompasses communities where most of the population resides that use recreation facilities in the area.

Cumulative Effects

Dispersed recreation opportunities including off-highway vehicle use, hunting, hiking, and sightseeing in the vicinity of the Carlin Trend have been restricted since the early 1980s because of intensified mining and exploration activities in the Carlin Trend. Recent wildfires have further reduced the opportunity for recreation in northeast Nevada.

The gradual but continuous expansion of mining activities in the Carlin Trend would result in less area available for dispersed recreation activity during operation and after cessation of mining until reclamation is complete. Any increase in population associated with mine development would result in more demand for recreation on public land.

To date, recreational use of approximately 34,000 acres in the vicinity of the Carlin Trend has been restricted due to mine development. Reasonably foreseeable mine development from 2007 to 2020 in the Carlin Trend would affect approximately 4,000 additional acres. Public access to these areas would be restricted to maintain safety and security during mine operations. Upon reclamation and closure these areas would be available for dispersed recreational use.

The overall changes in cumulative impact to recreation and hunting from past, present, and reasonably foreseeable mining related activities is likely to remain minimal, in part because of access restrictions related to mining areas currently exist and unrestricted areas adjacent to the Carlin Trend area remain available for dispersed recreational use.

Employment associated with mine operations, construction activity, and general population growth associated with employment in the Elko area affects the usage of recreational facilities throughout the Study Area. Downturns in employment result in an out migration of workers which in turn reduces the amount of usage of these areas.

Wildfires have limited the desirability of approximately 2,000,000 acres for recreational uses such as hunting and other activities.

GRAZING MANAGEMENT

Cumulative Effects Study Area

The Cumulative Effects Study Area for grazing is shown on **Figure 4-10** and includes all grazing allotments authorized to Tomera Ranches, Stonehouse Division. The rationale for this area is that the direct impacts of the Proposed Action affects only the Emigrant Spring Allotment, which is authorized to Tomera Ranches and would cumulatively affect their grazing operation.

Cumulative Effects

Cumulative effects on grazing resources result from wildfire, livestock grazing, introduction of noxious weeds and past, present, and reasonably foreseeable future mining activity. Locally and regionally, wildfires have reduced the density of shrubs and trees (i.e., sagebrush, juniper, and pinyon pine). Many of the woody species in the area are slow growing, in some cases requiring 15 to 20 years to reestablish.

Mine development in the Study Area has converted approximately 693 acres (Rain Mine) from livestock grazing in the Emigrant Spring Allotment to mining and related activities. Adjustment to the term grazing permit on the Emigrant Spring Allotment as a result of the Rain Mine Project has already been made. Reasonably foreseeable mine development in the Study Area between 2008 and 2025 would affect 3,466 acres representing 306 AUMs in the Emigrant Springs Grazing Allotment.

The loss of 306 AUMs to grazing as a result of the Emigrant Project adds incrementally to the regional loss in AUMs as land use shifts from grazing to mining. The reduction in land base for grazing is short term, lasting the life of the mine in most cases. Following reclamation, the majority of mine sites are made available for grazing. In addition, these site are often more

productive than adjacent native sites as native cultivars are used for reclamation and competition is limited to only those few species in the seed mixture.

Reclamation of mine related disturbances in the Study Area will be incremental as various operations reach the end of active mining and begin closure activities. Approximately 172 acres would remain as an open pit at the Rain Mine. Approximately 4,000 acres would be reclaimed to provide livestock grazing.

From 1999 through 2007 about 15 percent (approximately 68,000 acres) encompassed by the 9 allotments comprising the Study Area have been affected by wildfire. Stocking rates and seasons of use are periodically reviewed and adjusted by BLM in response to the severity of burns in the various allotments affected. Restoration and reseeding efforts to mitigate losses from wildfire have had varying degrees of success. Some areas seeded during the first appropriate season following a fire (fall or winter) exhibited successful seedling establishment, while other areas became infested with cheatgrass (a non-native annual grass), re-burned within a year or two, or did not respond, possibly due to drought or other climatic conditions. Some areas had adequate native perennial grasses and did not require herbaceous reseeding following wildfires.

Other restoration projects have included fencing burned areas to allow vegetation to recover and adjusting stocking rates and seasonal use to reflect available forage in the various pastures within each effected allotment.

Conversion of native shrub and woodlands to non-native annual grasslands and introduced noxious weed communities as a result of wildfire or disturbance associated with mining decreases available forage for livestock, reducing AUMs. While the majority of mining disturbance is reclaimed with herbaceous

species suitable for livestock grazing, and noxious weeds are controlled for the life of the mine, introduction of weed species and annual grasses could result in long-term range deterioration.

ACCESS AND LAND USE

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for access and transportation includes Interstate 80, State Secondary Route 766, Union Pacific Railroad, and areas adjacent to past, present, and reasonably foreseeable mining operations. These are the primary transportation routes for goods and services in the Carlin Trend and areas where access may be affected by existing and future operations.

The Cumulative Effects Study Area evaluated for land use and access encompasses roads and public land access in and adjacent to the proposed Emigrant Project.

Cumulative Effects

Access

Foreseeable mine development would result in access restrictions in the vicinity of the Emigrant Mine. Other routes exist in this area that would allow public access to locations blocked by this proposed development.

Numerous two-track roads provide access throughout the Study Area to support livestock grazing operations and public access for recreational purposes. Future mining operations could preclude use of these routes.

Land Use

Reclamation of mining disturbances to post-mining land uses would eventually result in reestablishing land use and access similar to pre-mining levels.

VISUAL RESOURCES

Cumulative Effects Study Area

The Cumulative Effects Study Area for visual quality incorporates existing and reasonably foreseeable mining activity through 2025.

Cumulative Effects

Reclamation measures are required and would occur on current and future mining activities in the Carlin Trend. However, major elements of certain mining facilities would remain, including local segments of pit highwalls and earth-fill structures (such as heap leach and waste rock disposal facilities). Although pits are proposed to be backfilled for the most part, and heap leach and waste rock piles recontoured, soiled and vegetated, visual contrasts in form, line, and color of soil and vegetation would remain in the post-mining landscape. VRM Class IV allows management activities that result in major modification to the character of the landscape. Impacts on visual resources from reasonably foreseeable mining activities can be minimized, but not eliminated, through reclamation measures. To continue to meet VRM Class IV objectives, all feasible measures should be taken to minimize visual impacts.

**SEE FIGURE 4-10 SAGE GROUSE
HABITAT CUMULATIVE EFFECTS
STUDY AREA**

Topography of the Study Area would be modified as a result of mine excavation, waste rock disposal, and reclamation. The Emigrant Mine would incrementally add to the alteration of topography and removal of mineral resources within the Study Area. However, the unusually shallow, tabular, side-hill geometry of the Emigrant deposit affords the opportunity to backfill previously mined-out pits with waste rock from on-going operations. Backfilling and reclamation would restore site topography in the mine pit area to near pre-mining configuration.

Development of the Woodruff Project could modify the natural landscape with construction of waste rock dumps, leach piles, and mine pit excavations. Mine development plans have not been submitted for this project site.

CULTURAL RESOURCES

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for cultural resources encompasses the proposed Emigrant Project permit area, Rain Mine site, and the Woodruff Project area (**Figure 4-6**). The Study Area is defined by the Area of Potential Affect and the areas that lie between each of these project boundaries. Rationale for this Study Area is based on differences in the intensity of prehistoric occupation north and south of the Humboldt River. The Emigrant study area south of the Humboldt River has less evidence of prehistoric occupation and use, therefore the Study Area encompasses the zone of the most intensive cultural surveys within this region.

Cumulative Effects

Compliance with Section 106 of the National Historic Preservation Act has minimized impacts to cultural resources in the Study Area as a result of mining disturbance. Cultural

resource inventories are completed by professional archaeologists that meet requirements set forth by the Secretary of the Interior. Resource inventories are completed prior to any mining-related disturbance. Contractor's reports of surveys to BLM include recommendations of site eligibility and potential project effects to significant cultural resources.

These reports are on file at the BLM Elko District Office. BLM reviews the contractor recommendations when making final determinations of site eligibility and potential project effects. These survey reports, along with BLM's final determinations, are submitted to the Nevada State Historic Preservation Office (SHPO) for inclusion into the Statewide Inventory. Formal consultation with SHPO may or may not occur, based on guidelines set forth in the Programmatic Agreement between Nevada BLM and SHPO.

Avoidance of sites determined eligible for the National Register of Historic Places is the preferred mitigation measure when sites are located within proposed project areas. When possible, mining-related facilities are redesigned to avoid eligible sites or specific cultural resources; however, avoidance is not always possible. In such cases, excavation and/or additional recordation of eligible sites by archaeologists is undertaken to mitigate potential adverse effects. Archaeologists prepare mitigation plans including a scope of work and specific scientific issues to be addressed as a result of the excavation and/or recordation for submittal to BLM. Plans are approved by BLM in consultation with SHPO. Upon final approval by BLM, excavation and field work commence in accordance with the approved plan.

Analysis of artifacts recovered from site investigations are contained in reports to BLM, who then provides SHPO copies of the approved report for inclusion in the Statewide

Inventory. In some cases, sites initially avoided have been subsequently damaged during mining related activities. In such instances, mining companies cease operations in the area, inform appropriate BLM authorities, and develop a treatment plan for submittal to BLM and SHPO. Field and archival research completed for the site is compiled in a final report to BLM and SHPO.

Some loss to archaeological resources may occur due to mining related disturbance within the Study Area to sites determined not eligible for the National Register. All sites represent nonrenewable pieces of America's prehistoric or historic past. Recordation of these sites preserves a written record of their existence to be used by future researchers interested in understanding Nevada's past. Mitigation of cultural resources preserves a picture of the past through scientific archaeological research.

Cultural resources identified in the Study Area are shown in **Table 4-6**. A total of 195 sites have been identified in the Study Area, of which 18 were determined eligible for listing on the National Register. Three historic properties at the Emigrant Project were located within the proposed disturbance boundary for the heap leach facility and would have been impacted during construction of that facility. A data recovery plan was prepared and approved by BLM in consultation with the Nevada SHPO, and implemented in 2005. A total of eight historic properties remain within the proposed Emigrant permit boundary and would be avoided. One additional eligible site located within the Study Area was mitigated in 2001. Six other eligible sites are located in the Study Area within the Woodruff Creek permit boundary. Of the 18 historic properties located within the Study Area, four have been mitigated and 14 remain unmitigated and eligible for the National Register.

TABLE 4-6						
Cultural Resources in Cumulative Effects Study Area						
Project	Prehistoric		Historic		Total No. of Resources	Sites Eligible for NRHP
	Sites	Isolates	Sites	Isolates		
Rain Mine	11	34	-0-	2	47	None
Woodruff Creek Exploration	5	5	1	0	11	None (Surveys prior to 1996)
	19 ¹	27	11 ¹	6	58	6 (P-III Associates Survey 1997)
Emigrant Project	12	20	-0-	-0-	32	Recovery Plans developed and implemented for 4 sites within the Study Area.
	28	18	1	-0-	47	8 sites located outside proposed disturbance boundary but within permit boundary.
TOTAL	75	104	13	8	195	

NRHP = National Register of Historic Places

¹ Contains 5 sites listed as both Prehistoric and Historic.

Source: Archaeological Research Services 1986, 1987; P-III Associates 1997, 2001, 2003, 2004; Varley 2005; Schmitt *et al.* 2005

Both historic and prehistoric properties have been recorded in the Study Area. Historic sites comprise about 8 percent of the total cultural resources identified and typically consist of scattered domestic trash dating to the early twentieth century. These scatters are likely associated with historic ranching and mining activities, and assigning such properties to a specific historic context or theme is difficult without the presence of diagnostic features or artifacts.

Prehistoric sites in the area are composed of lithic artifacts, primarily chipped stone debitage and tools, as well as ceramics. Few pieces of groundstone have been identified, and no surface features or fire-cracked rock were found during inventory surveys. Most heavily occupied prehistoric sites tend to be adjacent to perennial water sources such as streams and springs, while the smaller sites were located on saddles, ridges, valley edges, and valley interiors away from perennial water sources. Steep terrain and paucity of perennial water sources in the Study Area likely precluded long-term, residential occupation. Overall, prehistoric site density is much lower than areas along and north of the Humboldt River.

Cultural resource investigations conducted in the northern portion of the Piñon Range have provided valuable information on the settlement and subsistence activities of the Archaic, Late Prehistoric, and Proto-historic people of this area. This data base contains information on the spatial distribution and relationship of inferred site types to one another and to the upland landscape. The cultural resources recorded in the Study Area are important, and can be used to support regional archaeological research designs in future areal studies of the area.

Archaeological sites do not remain intact forever. The paleo-environmental record of Nevada exhibits evidence of natural erosive

forces that eradicate previous traces of human presence. These erosive forces continue to the present day. As a result, recovery of scientific information from sites within the Study Area reveals knowledge that would otherwise be lost.

While some loss of archaeological values has occurred due to mining-related activities within the Study Area from a cumulative perspective, this loss has been minimal. Reasonably foreseeable future actions include potential impacts to the 14 eligible sites that remain within the Emigrant and Woodruff Creek permit boundaries. However, the recordation and mitigation processes that are in place mitigate direct and cumulative adverse effects which ultimately lead to increased information regarding Nevada's past cultural heritage.

NATIVE AMERICAN CONCERNS

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for Native American Religious Concerns includes the Dixie Creek portion of the Dixie Creek-Tenmile Creek hydrographic basin no. 48 as shown on **Figure 4-6**. The rationale for the geographic area of cumulative effects is based on the importance of water sources to Newe/Western Shoshone traditionalists and land disturbance as it relates to loss of edible/medicinal plants, minerals, wildlife, potential loss of artifacts viewed as sacred objects and potential impacts to traditional/cultural/spiritual use sites and associated activities.

Cumulative Effects

Some Western Shoshone have expressed a concern that cumulative impacts may occur to their spiritual life and cosmology. The Proposed Action would potentially impact stream flow, vegetation patterns and wildlife distribution.

Such changes, individually and collectively, could impact the integrity of power spots, disrupt the flow of spiritual power (Puha), and cause the displacement of spirits (e.g., little men and water babies). Any such impact would limit the potential for Western Shoshone to participate in traditional religious activities.

Given that specific religious or traditional values, practices, human remains, or cultural items were not identified by the Western Shoshone in the project area, BLM has determined the potential for a cumulative impact to Native American traditional values is minimal.

SOCIAL AND ECONOMIC RESOURCES

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for social and economic resources encompasses Elko, Eureka, Lander, and Humboldt counties (**Figure 4-11**). The rationale for selection of this Study Area is outlined below:

- Residential patterns of mining company employees determine where they are likely to spend their salaries. Employees of mining companies do not necessarily live in the closest community to their employment nor do they live in the local governmental unit which receives increased tax revenues as a result of the facility. According to Sonoran Institute (2007), commuting data suggest that:
 - Elko County is a bedroom community (income derived from people commuting out of the county exceeds the income from people commuting into the county.) The net difference represents 15.5 percent of total income in the county.
 - Lander County is a bedroom community (income derived from people commuting out of the county exceeds the income from people commuting into the county.) The net difference represents 8.2 percent of total income in the county.
 - Eureka County is an employment hub (income derived from people commuting into the county exceeds the income from people commuting out of the county.) The net difference represents approximately 600 percent of total income in the county.
 - Humboldt County is an employment hub (income derived from people commuting into the county exceeds the income from people commuting out of the county.) The net difference represents 5.6 percent of total income in the county.
- Availability of local shopping opportunities determines where people are likely to spend their disposal income in the four-county Study Area. The majority of shopping opportunities, including availability of medical, financial, and personal services, are located in Elko (Elko County) and Winnemucca (Humboldt County). Dollars from Carlin and Battle Mountain “bleed” out of Eureka and Lander counties to Winnemucca and Elko.
- Most communities within the four-county area have a distinct sense of being a “local community” while sharing basic values and beliefs. Towns in the Study Area are remote from the rest of the state, connected by Interstate 80.

**SEE FIGURE 4-11 CUMULATIVE
EFFECTS STUDY AREA - GRAZING
MANAGEMENT**

Cumulative Effects

Characteristics of the socioeconomic environment that could have cumulative impacts from the remaining development associated with the Emigrant Project and other reasonably foreseeable projects in the area include population variations, availability of housing, public infrastructure and services, employment levels, and tax revenues. The *Past, Present, and Reasonably Foreseeable Future Activities* sections of this chapter describe land uses that affect socioeconomic resources.

Population Trends and Demographic Characteristic

The Cumulative Effects Study Area contains predominantly white communities, with Hispanic, Basque, and American Indian (mostly members of the Te-Moak Tribe of Western Shoshone) populations. Nevada is one of the fastest growing states in the U.S. (24.9% since 2000 Census). The two largest counties (Elko and Humboldt) have shown modest growth, while the two smallest counties (Lander and Eureka) lost population during the same period (**Table 4-7**). The towns of Elko (Elko County) and Winnemucca (Humboldt County) are well-developed and growing communities on either side of the Study Area, with smaller communities of Carlin and Battle Mountain in between Elko and Winnemucca.

TABLE 4-7					
General Demographic Information					
Characteristic	Elko County	Eureka County	Lander County	Humboldt County	State of Nevada
Total population (2006 estimate)	47,114	1,480	5,272	17,446	2,495,529
Percent Population change (April 1, 2000 to July 1, 2006)	4.0	-10.4	-9.0	8.3	24.9
Percent White, not Latino (2005)	70.9	83.2	77.5	73.2	60.0
Percent Latino (2005)	21.7	12.7	16.9	20.1	23.5
Percent Black (2005)	0.9	0.4	0.5	0.6	7.7
Percent American Indian and Alaska Native persons, percent, 2005	5.6	1.0	4.7	5.0	1.4

Source: U.S. Bureau of the Census 2007.

The number and variety of reasonably foreseeable projects planned in the Study Area would not likely result in additional workers moving into the area.

Transient workers are often involved in the construction of mines and related facilities. These workers are less likely to become part of the community through activities or socializing

and they face a stigma for not being long time members of the community.

Prostitution is legal and regulated by the State in the Study Area. The Battle Mountain Social Impact Assessment (Newmont 2005c) reported that prostitution does not seem to have a significant impact on social cohesion as it was not identified during discussions in the Battle

Mountain community. Prostitution is impacted by the mining industry mainly through influx of contractors during construction phases of large-scale projects. These contractors are generally single men, or men who have left their families temporarily for work. These men tend to frequent local bars and gaming establishments.

Housing

Long-term housing impacts generated by development of the Emigrant Project combined with other reasonably foreseeable projects in the Study Area depend in large part on where people (construction and operational workers) choose to live. The majority of workers in the Study Area live in Elko and Humboldt counties and commute to work in Eureka and Lander counties. There is sufficient capacity in the Spring Creek Lamoille area to accommodate all housing needs which might arise from development of the Emigrant Project.

The Battle Mountain Social Impact Assessment (Newmont 2005c) indicates real estate markets and property values are determined by the quantity and perception of supply and demand. Perception in Battle Mountain in early 2005 was that the community was going through a boom and new, temporary, and permanent residents to the town required housing. The effect is often an increase in property values of existing structures and an added impetus for adding housing units. However, unrealistic speculation about home prices on the part of sellers and an overall trend of rising property values can price some people out, negatively affecting the availability and affordability of housing. In addition, previous experience throughout the Study Area is that property values dropped precipitously when mines have closed, with many owners choosing to abandon their properties and allow foreclosure given an inability to sell homes even at depreciated values (Newmont 2005c).

Public Infrastructure and Services

Rapid population growth and loss (boom/bust cycles) also place a burden on fire, police, and Emergency Medical Services response to public safety incidents. Government agencies throughout the Study Area struggle with recruiting and retaining qualified personnel as many are drawn by the comparatively high wages of the mines.

The influx/loss of school-aged children into local school districts is also a major concern for local planners. With a state mandate of class sizes of 16 in elementary and middle schools, the addition of several new students could necessitate hiring additional teachers. Funding for the school districts is awarded on “two-year hold harmless,” which compensates districts for either their actual student population or the student population in either of the two previous years, whichever is higher. The Nevada legislature is currently considering legislation to revise it to a “one year hold harmless.”

Employment

The economic multiplier from mining has been estimated to be 1.7, although there is support for a range of 1.5 to 1.9 in some literature (Harrington 2005). In addition to future mine development in the Carlin Trend, the new TS Power Plant near Dunphy, and rail terminals in Elko and Winnemucca, will provide additional employment. These private sector investments will result in substantial contributions to employment levels in the Study Area.

Cumulative impacts on employment and income in the Study Area are dependent on timing of job openings, because job losses may be offset or at least mitigated by new projects. However, there is no guarantee the closure of one project and the construction/operation of another project will be offset in sequence or in number of jobs and economic opportunities. If any of

the existing projects were to close without one of the reasonably foreseeable projects coming online, communities in the Study Area would be impacted as some people would lose their jobs and incomes.

Goods and Services

Sustainable development begins with contractors and suppliers because they have the freedom to sell to others while maintaining a reliable contract with a known client. Although Newmont has proactively procured supplies and services from some local contractors (e.g., 3D Concrete, through negotiation of Newmont's contractor insurance requirements) and has proactively incubated some regional businesses (e.g., trucking contract with the Duckwater tribe, through flexible financing and payment arrangements), these success stories could be replicated by improving the transparency and consistency of Newmont's disclosure of procurement opportunities (Newmont 2005c).

Tax Revenues

In addition to employment taxes, net proceeds taxes paid by mineral development are a primary tax revenue source. Net proceeds taxes are generated for the state of Nevada in the county where the ore is mined, not the county where employees live. Companies pay property and sales taxes, and employees and supply chain contractors who reside locally generate tax revenue through their property and local purchases. For example, net proceeds are generated in Eureka County by the multitude of mining activities but the majority of employees live in Elko County. Net proceeds tax is a vital part of county revenue. Counties that have mining benefit, counties that house and provide services to miners must find the money to provide those services from other sources. Operation of the Emigrant Project would generate net proceeds taxes paid and

spent in Elko County, which would lessen somewhat the current situation.

Mining activity (and resulting net proceeds tax revenues) has consistently increased in Eureka and Humboldt counties, and has fluctuated, but decreased in Elko and Lander counties between FY 1999 - 2006. This is common in the Study Area as older mines go into closure and new mines are developed. The fluctuation in revenue stream has led to uncertainty about revenues into county budgets and the ability to fund public projects (Newmont 2005c).

Elko County Economy

Within a county economy, there are numerous economic sectors performing different tasks. All sectors are dependent upon each other to some degree. A change in economic activity by one sector will impact either directly or indirectly and induced affect the activity and viability of other sectors in the economy. In order to show these interdependencies and interventions between economic sectors, a county-wide input-output model IMPLAN (Minnesota IMPLAN Group, Inc., 2006), was used to derive economic linkages for Elko County in 2004. Estimates of the economic, employment, and labor income impacts of the Hard Rock Mining Sector on the Elko County economy are shown in **Table 4-8**.

Economic benefits of extending mining operations in the Carlin Trend would help maintain the status quo of the Hard Rock Mining Sector influence on the economy of Elko County. Mineral resources however, are finite and at some point in the future mining operations will cease and employment numbers, labor income, and indirect benefits to the regional economy could be reduced.

TABLE 4-8			
Economic, Employment, and Labor Income of the Hard Rock Mining Sector in the Elko County Economy, 2004			
Category of Impacts	Direct Effects	Indirect and Induced Effects	Total Effects
Economic	\$365,006,000	\$119,288,860	\$484,294,860
Employment	1,003	983	1,986
Labor Income	\$93,966,000	\$36,053,020	\$130,019,020

Source: Minnesota IMPLAN Group, Inc. "IMPLAN Pro Data for Elko County, 2004" Minnesota IMPLAN Group, Inc. Stillwater, Minnesota, 2006.

ENVIRONMENTAL JUSTICE

Cumulative Effects Study Area

The Cumulative Effects Study Area (Study Area) for environmental justice encompasses the area between Elko and Winnemucca on Interstate 80, including Elko (including the Elko Band Colony), Eureka, Lander (including the Battle Mountain Band), and Humboldt counties. Both bands are part of the Te-Moak Tribe of Western Shoshone Indians. These bands represent minority populations within the vicinity of the Carlin Trend.

Cumulative Effects

There would be no cumulative effects to environmental justice as a result of the Proposed Action.

Identification of Minority and Low Income Populations

Minority populations are persons of Hispanic or Latino origin of any race, Blacks or African Americans, American Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders. *Low-income populations* are persons living below the poverty level. In 2000, the poverty weighted average threshold for a family

of four was \$17,603 and \$8,794 for an unrelated individual (U.S. Bureau of the Census 2002). Estimates of these two populations were then developed to determine if environmental justice populations exist in the Study Area.

The Council on Environmental Quality identifies these groups as environmental justice populations when either (1) the minority or low-income population of the affected area exceeds 50 percent or (2) the minority or low-income population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis. In order to be classified meaningfully greater, a formula describing the environmental justice threshold as being 10 percent above the State of Nevada rate is applied to local minority and low-income rates.

In 2006, the Study Area contained 71,312 persons, of which approximately 19,821 (28%) were minorities and approximately 6,443 (9%) were living below the poverty level. Minority and low-income populations were consistently lower in each of the counties in the Study Area than for the State of Nevada (**Table 4-9**). The Elko Band Colony in Elko County and the Battle Mountain Band of the Te-Moak Western Shoshone tribe in Lander County meet the description of environmental justice

populations, both because of minority and poverty status (**Table 4-9**). For each Band the percent of minority persons and the percent of people below the poverty level are more than 10 percent above the State of Nevada rate.

Cumulative impacts due to construction and operation of reasonably foreseeable mine projects, combined with past and present activities in the Carlin Trend to these tribes, were evaluated and described in the *Native American Religious Concerns* section of this chapter.

TABLE 4-9
Minority and Low-Income Populations - 2000

Location	Total Population	Percent Minority	Percent Below Poverty (1999)
Elko County ¹	47,114	29.1	8.7
<i>Elko Band Colony</i> ²	730	86%	23.0
Eureka County ¹	1,480	16.8	9.0
Lander County ¹	17,446	26.8	9.8
<i>Battle Mountain Band</i> ²	124	90.0	28%
Humboldt County ¹	5,272	22.5	9.5
State of Nevada ¹	2,495,529	40.0	11.1

Source: ¹ U.S. Bureau of the Census 2007; ² Sonoran Institute 2007.